MHF4U Name _____

Unit B Test – Trigonometry
PRACTICE TEST

Multiple Choice

Identify the choice that best completes the statement or answers the question.

____ 1. Convert 135° to radians.

a. $\frac{3\pi}{4}$

b. $\frac{24\,300}{\pi}$

c. $\frac{4\pi}{3}$

d. $\frac{5\pi}{4}$

____ 2. Starting on the positive *x*-axis and moving $\frac{1}{3}$ of the way around a circle that has radius 3 m, how far would one travel?

a. 3.14 m

b. 360 m

c. 6.28 m

d. 0.69 m

____ 3. Convert $\frac{11\pi}{6}$ radians to degrees.

a. 98.18°

b. 330°

c. 300°

d. 98.6°

____ 4. Which is equivalent to $-\frac{\sqrt{3}}{2}$?

a. $\sin\left(\frac{\pi}{6}\right)$

b. $\sin\left(\frac{5\pi}{6}\right)$

c. $\cos\left(\frac{\pi}{6}\right)$

d. $\cos\left(\frac{5\pi}{6}\right)$

____ 5. If $\sec\left(\frac{2\pi}{3}+x\right)=2$, what does *x* equal?

a. $\frac{2\pi}{3}$

b. $\frac{4\pi}{3}$

c. $\frac{3\pi}{2}$

d. $\frac{3\pi}{3}$

____ 6. A Ferris wheel has a radius of 20 m, makes a full rotation in one minute and the axle stands 25 m above the ground. Which equation models the height of a chair of the Ferris wheel that starts at the top, where *x* is in seconds?

a. $y=20\sin\left(60x+\frac{\pi}{2}\right)+25$

b. $y=20\sin\left(\frac{\pi}{30}x+\frac{\pi}{2}\right)+25$

c. $y=20\cos\left(\frac{\pi}{30}x-\frac{\pi}{2}\right)+25$

d. $y=10\sin\left(\frac{\pi}{30}(x)\right)+25$

____ 7. A hamster wheel is in a cage on top of a table. If the high point of the wheel is 15 cm above the table and the lowest is 3 cm above the table and the table is 1 m off the ground, how high is the axis of the wheel relative to the ground?

a. 9 cm
b. 1.06 m
c. 1.09 m
d. 1.12 m

____ 8. The temperature of a swimming pool is cyclic and modelled by a trigonometric function. If its highest temperature is 82 °F and its lowest temperature is 76 °F, and it takes 12 hours for the temperature to change between its extremes, what equation models the temperature of the pool as a function of time in hours?

a. $y = 3\cos\left(\frac{2\pi}{24}t\right) + 79$
b. $y = 3\cos\left(\frac{2\pi}{12}t\right) + 79$
c. $y = 3\sin\left(\frac{2\pi}{24}t\right) + 79$
d. $y = 6\cos\left(\frac{2\pi}{24}t\right) + 79$

____ 9. A plane makes a loop in the air modelled by the function $h(t) = 3\cos\left(\frac{\pi}{16}t\right) + 5$, where h is in km and t is in seconds. If the plane makes only one full loop, what time(s) are the instantaneous rate of change 0?

a. 8, 24
b. 16, 48
c. 0, 32
d. 0, 16, 32

10. If $\cos\theta = \frac{3}{4}$, what are the possible values of θ in radians?

11. A mouse wheel is 16 cm in diameter and the base of the wheel is 2 cm off the ground. If the hamster can spin the wheel 4 times each second, what is the sine function that describes the movement of the wheel if it starts at its lowest point?

12. Angle θ lies in the second quadrant and $\sin\theta = \frac{7}{25}$. Determine an exact value for $\cos 2\theta$.

13. Determine the exact value for each of the following:

a) $\sin\frac{5\pi}{4}$

b) $\cos\frac{11\pi}{6}$

c) $\tan\frac{\pi}{8}$

d) $\csc\frac{7\pi}{12}$

14. Solve the following equations

a) $3\sin^2 x + 4\sin x - 9 = 3\sin^2 x - 8\sin x + 10$

b) $\sin^2 x = 1$

c) $10\sin^2 x + \sin x - 6 = -4$

15. The volume of air in the lungs during normal breathing can be modeled by a sinusoidal function of time. Suppose a person's lungs contain from 2200 mL to 2800 mL of air during normal breathing. Suppose a normal breath takes 4 seconds, and that $t = 0$ *s* corresponds to a minimum volume. [14A]
    a. Let *V* represent the volume of air in a person's lungs. Draw a graph of Volume versus time for 20 seconds.
    b. State the period, amplitude, phase shift and vertical translation for the function.
    c. Write a possible equation for the volume of air as a function of time.
    d. Describe how the graph would change if the person breaths more rapidly.
    e. Describe how the graph would change if the person took bigger breaths.
    f. Determine the amount of air in the lungs after 8 seconds.
    g. Determine when, within the first 8 seconds, the volume is 2400 mL.

16. Transform the graph of f(x) = cos x to sketch g(x) = 3 cos (2x) – 1, and state the period, amplitude, and phase shift of each function.

17. Prove $\cos(x+y)\cos(x-y) = \cos^2 x + \cos^2 y - 1$